

Outpatient intervention based on complexity categorization in neurorehabilitation.

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ABSTRACT

Background: There are multiple factors that hinder access to high intensity therapies. Few studies have considered the effectiveness of outpatient motor neurorehabilitation based on direct patient care, caregiver-mediated exercises and self-directed exercises. **Objective:** Evaluate the effect of an categorized outpatient motor neurorehabilitation program in a Public Hospital with respect to functionality, mobility and balance. **Material and Method:** Retrospective cohort study. The patients seen in 2018 at the Neurorehabilitation polyclinic of the Carlos Van Buren Hospital were analyzed, the data was collected from the medical records, they were categorized into three levels of complexity in rehabilitation and the statistical analysis was performed. **Results:** A total of 34 users were studied, the most recurrent diagnosis was stroke in 82.3%. On the functional scales, all values changed from highest to lowest severity post intervention (modified Rankin, Barthel index, functional level and walking speed). In relation to proportional recovery, low complexity patients achieved 13.5%, median 83% and high 25%. **Conclusions:** The results indicate that an outpatient motor Neurorehabilitation program provides favorable functional changes for patients of medium complexity in rehabilitation. The use of a complexity-based categorization of rehabilitation is a useful option in the clinical setting, but further research is required.

Keywords: Neurological Rehabilitation, outpatient intervention, complexity categorization.

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INTRODUCTION

Neurological disorders are a major cause of disability worldwide⁽¹⁾. In Chile, 16.7% of the population is disabled; and 35.4% of this figure has been diagnosed with a pathology of the nervous system⁽²⁾. Medical advances have significantly reduced mortality from neurological diseases but have increased the number of disabled survivors. On the other hand, rehabilitation strategies have not advanced accordingly, since motor recovery is a dynamic process driven by multiple factors.⁽³⁾

After structural damage to the brain, there can be recovery through experience-dependent neuroplasticity, which can be induced by high-intensity⁽⁴⁾, early⁽⁵⁾ rehabilitation, with high frequency of care, training based on repetitive tasks^(6,7), and multidisciplinary rehabilitation⁽⁸⁾, among others. It is also described that outpatient rehabilitation programs are effective to improve physical functions, mobility and balance after a cerebrovascular accident (CVA)⁽⁹⁾. There are different intervention strategies in rehabilitation, among them, defining objectives together with the patient and their families can be an enabler to encourage participation⁽¹⁰⁾. Caregiver-guided exercises can be a useful intervention to increase the intensity of rehabilitation in acute to chronic stages⁽¹¹⁾. Also, a self-management training strategy provides responsibility and confidence to practice exercises at home, thus increasing the amount of practice. This can optimize motor learning and improve long-term results⁽¹¹⁾. Pollock (2014) mentions that no physical rehabilitation approach is better than another to promote function recovery and mobility after a stroke, therefore it is necessary to individualize the treatment and not be limited to just one.⁽¹²⁾

Another highly relevant aspect is the ability to make a rehabilitation prognosis by using objective indicators that have a predictive value of a functional recovery from a stroke, which makes it possible to simplify treatments and establish objectives⁽¹³⁾. In Chile, models based on clinical

variables through a rehabilitation categorization based on the complexity of patients' diagnoses, have been proposed, making it possible to standardize the evaluations and define therapeutic loads.⁽¹⁴⁾

Regarding access to rehabilitation, multiple factors⁽¹⁵⁾ have been found to reduce the possibility of receiving high-intensity care. In the case of Valparaíso, the following stand out: high levels of dependency of the disabled population, the geographical characteristics of the area, little connectivity to healthcare centers, and a high demand of public healthcare establishments⁽¹⁶⁾. Thus, the Neurorehabilitation Polyclinic has categorized its patients by rehabilitation complexity and developed an intervention strategy for them, which consists of direct care, caregiver guided exercises and self-management in rehabilitation. The objective of this study is to assess the resulting effects on functional, mobility and balance in patients treated by an outpatient motor neurorehabilitation program at the Carlos Van Buren Hospital during 2018.

MATERIALS AND METHODOLOGY

An observational, analytical, retrospective cohort study was carried out, with the approval of the Ethics-Scientific Committee of the Valparaíso-San Antonio Health Service (ORD 2696/2019).

The records of the Neurorehabilitation polyclinic patients of the Carlos van Buren Hospital in Valparaíso, cared for between January and December of 2018, were studied. All the users were intervened under a modality of individualized care, which consisted of one hour-long sessions per week, self-management strategies training in rehabilitation sessions and caregiver guided exercises to perform at home.

The inclusion criteria for this study were established as: users of the Neurorehabilitation polyclinic treated during 2018 who presented motor disability due to an acquired brain injury.

The data was obtained during the month of November of the year 2019 from the clinical history of each user and they were recorded anonymously. The variables collected were: sex, age, medical diagnosis, total number of sessions received, evolution timeline from the date of injury to admission, to outpatient rehabilitation. Regarding the outcome numbers, the level of functional capacity was considered at the beginning and at the end of the intervention through the Modified Rankin scale⁽¹⁸⁾, the level of dependence performing daily activities through the Barthel Index⁽¹⁹⁾, risk of falling and losing balance through the Berg balance scale⁽²⁰⁾, highest motor functional level according to The Johns Hopkins Highest Level of Mobility scale (categories 1,3,5 y 7)⁽²¹⁾ and lastly, pace.⁽²²⁾

Once the information was collected, the patients were classified using a matrix created by the researchers, which was based on a previous study carried out by Gutiérrez Panchana in 2018⁽¹⁴⁾ and which is detailed in **Table 1**.

The integrated data was classified into three groups of complexity in rehabilitation (low, medium, and high). The initial complexity categorization score, the changes that occurred in the post-intervention categorization and the proportional recovery were calculated, using a clinical score expressed as a percentage that is calculated using

the absolute improvement relative to the available improvement.⁽²³⁾

Data analysis was performed using non-parametric statistics. For the qualitative variables, data was described by frequencies and percentages, and in the case numerical variables, averages and interquartile ranges were used. Additionally, the Kruskal-Wallis test was used, in order to carry out the analysis between the start time of post-injury treatment and the variation of the scores by complexity. The same test was used to compare the proportional recovery of the different groups of complexities in rehabilitation. The statistical analysis was performed using software STATA 16, always considering a significance level of 0.05 and a statistical power of 80%.

RESULTS

87 patients were treated at the Neurorehabilitation polyclinic during 2018, and after applying the inclusion criteria, 34 users were selected. Patients who abandoned their treatment, who suffered from other neurological diagnoses, presented signs of remission or were deceased, were excluded.

Patients were categorized by complexity in rehabilitation through a matrix of clinical variables where the scores ranged from 4 to 12 points, establishing that 8 users corresponded to low, 10 to medium and 16 to high complexity

Table 1. Neurorehabilitation Complexity Categorization.

Neurorehabilitation Complexity Scale			
Evaluations / Score	1 points	2 points	3 points
Modified Rankin	0 - 2	3	4 - 5
Barthel Index	60 - 100	40 - 55	0 - 35
BERG scale	41 - 56	21 - 40	0 - 20
Functional level	Biped - Walking	Seated	Supine
Complexity in Rehabilitation	4 points Low	5 - 8 points Median	9 - 12 points High

in rehabilitation. The most frequent diagnosis was CVA with an 82.3%. The different groups underwent an average of 10 treatment sessions. 61% of patients were treated within three months after the date of injury. **(Table 2)**

When reviewing the changes in Modified Rankin, 35.3% started at level 5 and post-intervention, most of the group was at level 2 (35.3%). All the severity values changed to less compromised levels, in Barthel index, Berg scale, functional level and gait speed.

Regarding the score used to classify patients, it was observed that the median was 8 points in the average complexity in rehabilitation, and 12 points in the high complexity group (maximum obtainable in severity). Patients who were classified as low complexity could not achieve any changes because they are already at the minimum for this assessment. Therefore, for purposes of

proportional recovery analysis, walking speed was used, where 62.5% achieved an improvement, with a median recovery of 13.5%. As for the group of medium and high complexity, they improved by a median of 2 points. 50% of the medium complexity patients were able to reduce their severity, and 90% managed to improve their functional condition with a median proportional recovery of 83%. 18.75% of the high complexity patients lowered to medium complexity and 12.5% to low complexity, in addition, all the patients managed to improve their functional condition with a median proportional recovery of 25% **(Table 3)**.

When evaluating the groups from their admission date to outpatient rehabilitation, starting with the date of their brain injury and in relation to the score variation and classification by complexity, significant differences were observed between the groups admitted before 3 months and the

Table 2. General characteristics of the patients of the Neurorehabilitation Polyclinic of the Carlos Van Buren Hospital.

Characteristics	Total	Complexity in Rehabilitation		
		Low	Median	High
Gender, n (%)				
Men	17 (50%)	5 (62,5%)	5 (50%)	7 (43,75%)
Women	17 (50%)	3 (37,5%)	5 (50%)	9 (56,25%)
Age, median (IQR) years	58,5 (44-68)	52 (43,5-60,5)	63 (39-68)	57 (46,5-73,5)
Diagnosis, n, %				
CVA	28 (82,35%)	6 (75%)	6 (60%)	16 (100%)
CNS tumor	5 (14,71%)	2 (25%)	3 (30%)	0
ECT	1 (2,94%)	0	1 (10%)	0
Treatment sessions, median (IQR) days	10 (9-18)	8,5 (4-11,5)	9,5 (7-19)	13,5 (10-19,5)
Start of post-injury treatment, n (%)				
0 - 3 months	21 (61,76%)	3 (37,50%)	6 (60%)	12 (75%)
3 - 6 months	4 (11,76%)	0	2 (20%)	2 (12,5%)
More than 6 months	9 (26,47%)	5 (62,50%)	2 (20%)	2 (12,5%)

Table 3. Indicators of global results of the patients of the Neurorehabilitation Polyclinic of the Carlos Van Buren Hospital.

Variable	Total	Complexity in Rehabilitation		
		Low	Median	High
Initial Complexity Categorization Score, Median (IQR) points	8 (5-12)	4 (4-4)	7 (6-8)	12 (11-12)
Change in complexity categorization, n (%)				
No changes	24 (70,59%)	8 (100%)	5 (50%)	11 (68,75%)
Reduced 1 level	8 (23,53%)	0	5 (50%)	3 (18,75%)
Reduced 2 levels	2 (5,88%)	0	0	2 (12,50)
Changes in complexity categorization score, (IQR) median points	1 (0-1)	0	2 (1-3)	2 (1-3)
Proportional recovery, n (%)				
Did not improve	4 (11,76%)	3 (37,50%)	1 (10%)	0
Partial improvement	23(67,63%)	5 (62,50%)	4 (40%)	14 (87,7%)
Maximum Improvement	7(20,59%)	0	5 (50%)	2 (12,50%)
Functional recovery, (IQR) median %	27(13 - 67)	13.5 (0-49)	83.5 (50-100)	25 (13-46,5)

one admitted after 6 months (Kruskal-Wallis $p = 0.009$) and between the group admitted between 3 and 6 months and the one admitted after 6 months (Kruskal-Wallis, $p = 0.04$). When comparing the proportional recovery of the different groups of complexities in rehabilitation, we found statistically significant differences between the medium complexity group compared to the high complexity group (Kruskal-Wallis $p = 0.01$) as well as between the medium complexity group and the low complexity group (Kruskal-Wallis $p = 0.02$).

DISCUSSION

A variation of scores stands out between the levels of greater and less commitment, in all the variables considered. 29.49% of the patients managed to walk in the community, which is close

to the figures reported by Harvey (2015), who has mentioned numbers between 30% and 50%.⁽²⁴⁾

Louie (2017), reported that a score of 29 points on the Berg scale is predictive of recovering gait speed consistent with strolling around the community⁽¹³⁾. In this study, only 52.63% of those who obtained this score achieved such a result. The medium complexity group benefited the most from the proportional recovery, displaying an 83% improvement, as well as significant differences in comparison to the other groups. Proportional recovery allows to detect treatment effects despite interindividual variability and generally ranges from 63% at 3 months and 30% to 78% at 6 months post-stroke⁽²³⁾. It is suggested to consider other strategies for patients with other complexities aiming to improve their proportional recovery.

The intervention allowed an improvement in two functional areas, which could suggest changes in the care model and provide guidelines that aim to help discharging patients from outpatient hospital care and admitting them to primary health care.

There were significant differences between the groups that started before 6 months compared to the ones that started later. This is consistent with what was observed by Belagaje (2017), who stated that patients who started their treatment within the first 20 days were associated with a better therapeutic response compared to those who started later.⁽²⁵⁾

Within the biases, patients with no or minimal deficit were excluded, which could explain why less recovery is observed in the users of this study in relation to what was shown by Harvey (2015)⁽²⁴⁾. On the other hand, the users studied had different treatment lengths and several different professionals evaluated and treated them during the period studied.

The use of a customized matrix makes the comparison with other studies difficult. However, it allowed us to analyze the functional performance of patients and thus observe changes according to their commitment. It should be noted that these assessments portray a prognostic utility⁽²⁵⁾ therefore preparing classification templates for each rehabilitation, could contribute to optimizing results and decision-making, thus favoring a multidisciplinary rehabilitation approach.⁽²⁶⁾

The classification template was composed of multiple assessments that were of functional nature. Even so, certain aspects of the sensory systems or cognitive processing assessment were not considered, becoming a recurring limitation for motor recovery research in general, as reported by Bolognini et al in 2016⁽²⁶⁾, stating that these areas negatively affect motor recovery, independence, and social reintegration.⁽²⁷⁻³⁰⁾

Multiple barriers to the routine use of assessments have been described, so the use of easy-to-apply tools with results that can be clearly interpreted are

suggested⁽¹⁴⁾. Furthermore, an accurate prediction of functional outcome can potentially improve the quality of care.⁽²⁴⁾

The care model of the Neurorehabilitation polyclinic achieved favorable results within functional scales, by increasing patients' therapeutic load, without the need to go to the hospital several times. This could be replicated in sectors where similar contexts are observed. Although an optimal frequency has not been proposed⁽³¹⁾, a greater intensity of rehabilitation leads to better functional results^(32,33), occurring mainly in hospital contexts. However, a common strategy to optimize healthcare resources is to offer outpatient care instead of hospital care, which is characterized by lower intensity and even lower latencies prior to restarting their therapies⁽³²⁾. Neurological rehabilitation must consider socioeconomic aspects of patients to achieve high efficacy⁽³⁴⁾. It has been described that the costs of outpatient care in people who have suffered a stroke, are mainly related to the severity of their pathology and their transfer to the hospital to attend their therapies⁽³⁵⁾. For this reason, the challenge for health personnel and the health system is to search for alternatives that allow improving access to rehabilitation. One of the limitations of the self-management process was the absence of a record of daily participation, and of the rehabilitation received at home. In 2016, Plant⁽¹⁰⁾, mentioned that the delivery of supporting material allows establishing objectives and confidence in the treatment. Caregiver exercises are viewed as a useful treatment option only if they are added to usual care, but it is essential to standardize and establish a frequency within safe parameters⁽⁷⁾. In addition, the caregiver is required to be willing to train and participate in rehabilitation.⁽³⁶⁾

The care model based on the complexity of the patient is presented as a useful tool since it allows standardized evaluations and promotes the optimization of resources. In addition, it favors decision-making and patient - family participation in treatments. In 2018, Gutiérrez Panchana⁽¹⁴⁾

discussed these problems and described this way of working as a more up-to-date, comprehensive, interdisciplinary clinical care with a holistic vision.

CONCLUSION

The direct care model related to self-management in rehabilitation and caregiver guided exercises is

effective in brain injury patients with a medium complexity.

The use of a rehabilitation classification based on the complexity of the patients is a useful option in the outpatient clinical environment, allowing adjustments of the therapeutic load, favoring an appropriate intervention plan, nevertheless, more research is required.

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